The North Korea Instability Project

North Korean Collapse: Weapons of Mass Destruction Use and Proliferation Challenges

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June 2017

SAIS Johns Hopkins School of Advanced International Studies | USKI

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Among all the challenges associated with a North Korean collapse, the use of weapons of mass destruction (WMD) or movement of WMD out of the country will have the largest strategic implications. The extensive size and complexity of North Korea's nuclear, chemical and biological (NBC) weapons programs make it virtually impossible for the alliance between the United States and the Republic of Korea (ROK or South Korea) to have 100 percent clarity of intelligence and greatly increases the likelihood that regime forces, individual opportunists, fleeing members of the regime leadership or breakaway separatists could gain access to WMD. Therefore, it is useful to examine these programs, both in terms of historical examples of chemical and biological use in low intensity conflicts, and potential future employment and proliferation scenarios. This approach will permit a better appreciation of the WMD challenge associated with a collapsing North Korea that is grounded not only in plausible speculation but also in historical precedent.

I. Program Background

Since the 1980s, the North Korean leadership has recognized the tactical advantages the US-ROK alliance possesses in land, sea and air domains. Therefore, the Kim regime began to develop asymmetric advantages first through the development of chemical and possibly biological weapons, and subsequently through its extensive nuclear and missile programs.

1. Chemical

North Korea has maintained a large, operationally ready stockpile of persistent and non-persistent chemical warfare agents capable of delivery via artillery, rockets, missiles and aerial bombs. The program—consisting of mustard agents, lewisite and both G-series and V-series nerve agents—fits within the normal construct of a warfighting chemical program. This mix of agents and delivery systems supports both rapid defensive and offensive use along the demilitarized zone (DMZ) as well as attacks to halt or slow down the flow of reinforcements and logistics through US and ROK airbases and seaports.[1,2] The latest development—and most brazen proof that the program exists—was the use of VX nerve agent to assassinate Kim Jong Nam, Kim Jong Un's half-brother, in Kuala

1 "North Korea: Chemical Program," Nuclear Threat Initiative, Last modified December 2015, http://www.nti.org/learn/countries/north-korea/chemical/.

2 Emma Chanlett-Avery et.al, "*North Korea: U.S. Relations, Nuclear Diplomacy, and Internal Situation,*" Congressional Research Service, January 15, 2016, pg. 13.

Lumpur, Malaysia, indicating a willingness to use CW agents in unconventional ways.[3]

While much of the North Korean stockpile may be aging, the regime retains a chemical industry that can serve as a warm production capability hidden in plain sight. This industry allows either manufacture of new agents to replace deteriorating munitions or expansion of the stockpile.

2. Biological

North Korea is believed to maintain a biological weapons program even though it is a member of the Biological and Toxins Weapons Convention. North Korea could readily conduct research, development and possibly small-scale production under the guise of legitimate pharmaceutical and medical research.

Biological weapons occupy an interesting role within the WMD landscape as contagious pathogens can be used to create a large strategic outbreak, non-contagious pathogens can target operational forces or populations, and toxins are effective for assassinations. In all cases, biological weapons can provide a means of anonymity through covert delivery and even total deniability through the selection of diseases endemic to the region or targeted country.

Over the past 40 years, the DPRK has established a history of assassinations in South Korea (and now Malaysia). Likewise, they have often taken provocative actions that could not be easily attributed back to the regime, like the 2010 sinking of the ROK Naval vessel *Cheonan*. These actions reinforce an expectation that the Kim regime would pursue a covert biological weapons program.[4,5]

3. Nuclear

Over the same time period, the Kim regime has invested heavily in the development of ballistic missiles and nuclear weapons. The ballistic missile program provided real warfighting capabilities and a commodity that generated income for the state through sales to Syria and Iran. North Korea could funnel this money into developing a nuclear program, which it views as central to establishing the country's place in the world order and deterring outside aggression.

Under Kim Jong Il, North Korea was satisfied with a steady developmental pace that supported using the program as part of the country's coercive foreign policy, which centered on using provocative actions as leverage to negotiate concessions with the ROK and US. The most famous example was during the 1990s when North Korea agreed to halt its nuclear program in exchange for food and energy guarantees. This was a setback that Kim Jong Il was fully prepared to accept, as he continued his covert pursuit of a nuclear deterrent. The effect of maintaining a covert program enabled a rapid breakout once the DPRK decided to renege on the agreement.

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3 Executive Council Decision (EC-84/DEC.8), Organization for the Prohibition of Chemical Weapons (OPCW), March 9, 2017, https://www.opcw.org/fileadmin/OPCW/EC/84/en/ec84dec08_e_.pdf.

4 North Korea: Biological Program, Nuclear Threat Initiative, December 2015, http://www.nti.org/learn/countries/north-korea/biological/.

5 Chanlett-Avery, pg. 13.

Kim Jong Un's ascension to power only served to accelerate North Korea's ballistic missile and nuclear programs. The past five years have seen increased testing of both nuclear devices and ballistic missiles. The importance of the nuclear weapons program was solidified in May 2016 when Kim Jong Un established it along with economic growth as the two pillars of North Korean strength.[6] Once it is capable of miniaturizing a warhead to a size that fits onto a successfully tested ICBM, the United States will likely face an even more emboldened and belligerent North Korea. In the meantime, the North is probably capable of limited nuclear weapons use, most likely employed defensively within North Korea or covertly in the surrounding region.

II. Historical Insights

History often has a way of repeating itself, not merely by accident, but because rogue actors model and improve upon past successful actions. To gain a better understanding of the dangers these WMD programs pose, it is useful to have an appreciation of past uses. While the world's experience with nuclear weapons use is extremely limited, the past is replete with examples of chemical and biological weapons use. States have used these weapons against other countries in major wars or to suppress opposition during internal unrest, and non-state actors have developed and used them against military forces attempting to liberate territory from autocratic regimes. Two of these broad scenarios could play out should the US and ROK militaries attempt to stabilize a collapsing North Korea.

1. Chemical Weapons Use

From the earliest use in World War I, experts recognized that chemical weapons provide a means of offsetting an operational inferiority or breaking a stalemate. Germany and later allied forces used chlorine and mustard gas, initially against unprotected forces, to breach the trenches along the Western Front. Throughout the Cold War, the USSR dedicated entire artillery regiments to firing large salvos of chemical munitions, reminiscent of World War I, to break through NATO defenses. Likewise, the US developed and maintained large stockpiles of chemical weapons to deter Soviet chemical use, and if necessary, to blunt a Warsaw Pact attack. The employment of chemical weapons would have forced Soviet-aligned maneuver forces to wear cumbersome protective equipment while being channeled into designated areas where ground attack aircraft could destroy them. The bottom line is that the basic tenets of chemical warfare in major state-on-state war have not technically changed in over 100 years, and they will probably not change along the heavily-defended Demilitarized Zone (DMZ) in Korea.

What has evolved of late is the reemergence of chemicals as weapons in low-intensity warfare by both insurgents and governments. The period since 2003 provides several examples of chemical weapons use. The first employment arose shortly after the US-led coalition overthrew Saddam Hussein in Iraq. Regime loyalists, other groups vying for power and those simply looking to expel US forces initiated an insurgency that made extensive use of improvised explosive devices (IEDs). These early IEDs were made predominately of conventional artillery or mortar shells that coalition forces failed to secure during the rapid advance to Baghdad. Chemically filled munitions

6 James Pearson, "North Korea Leader Kim Sets Five-Year Economic Plan, Vows Nuclear Restraint," *Reuters*, May 8, 2016, http://www.reuters.com/article/us-northkokrea-congress-idUSKCN0XY0QB

were occasionally, though evidently unintentionally, included in these IEDs. Poor marking and accounting by the Iraqi government of the pre-1991 chemical weapons that comprised the supply of munitions for these IEDs proved a double-edged sword. On the one hand, it precluded insurgents from recognizing the presence of the more impactful chemical munitions, thereby reducing the impact some of their attacks may have had. On the other hand, it also precluded coalition Explosive Ordinance Disposal (EOD) forces from fully recognizing the threat they faced, resulting in a small number of casualties that may have been avoidable. It should be noted that even with these challenges, coalition forces recovered 4,573 filled and unfilled pre-1991 chemical munitions between May 2004 and March 2009.[7] This number of recovered and employed munitions would have been far higher had there not been an international effort after Operation Desert Storm to destroy Saddam Hussein's vast stockpile. While unsecured residual chemical weapons did not cause as much damage as they could have, the US and ROK would probably not be as lucky in Korea, especially given the potentially vast number of filled munitions.

Secondly, in 2006 and 2007, insurgents in Iraq operating as part of al-Qaeda in Iraq (the predecessor to the Islamic State in Iraq and Syria, ISIS) deliberately turned to chlorine in an attempt to gain an asymmetric advantage. The attacks sought to expand the war from emplaced IEDs intended to ambush coalition convoys and patrols to vehicle-borne IEDs (VBIEDs) targeting softly protected government facilities or population centers. The insurgents drove delivery trucks laden with large chlorine tanks up to coalition bases where they would use conventional explosives to rupture tanks, spreading a chlorine cloud over the base to kill US forces.

These early attempts failed to provide the desired effects mainly because insurgents were using too many explosives and either consuming the chlorine in the explosion or simply ejecting the tanks that would not break open. Meanwhile, US forces adapted their posture by instituting new defensive measures that, when added to the relatively ineffective techniques used to deliver the chlorine, rendered the effort a failure. However, it provides a model that an intelligent, adaptive adversary could modify with chlorine or other toxic industrial chemicals in the future. [8,9] The use of toxic industrial chemicals allows insurgents a means to conserve conventional munitions while adding additional cost and complexity for the United States.

The next example is the Bashar al-Assad regime's use of chemical weapons against the Syrian people. In July 2012, Syrian Foreign Ministry spokesman Jihad Makdissi proclaimed that the Syrian regime would use previously undisclosed chemical weapons, which had been developed as a strategic deterrent to Israel, against any foreign intervention.[10] This threat to break one of the most universally accepted international norms—not using chemicals as weapons of war—

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7 "U.S. Intelligence Documents on Chemical Weapons Found in Iraq," *The New York Times*, October 14, 2014, https://www.nytimes.com/interactive/2014/10/14/world/middleeast/us-intelligence-documents-on-chemical-weapons-found-in-iraq.html#document/p24/a179562.

8 "Iraq Insurgents Employ Chlorine in Bomb Attacks," *The New York Times*, February 22, 2007, http://www.nytimes.com/2007/02/22/world/middleeast/22iraq.html.

9 "Al Qaeda's track record with chemical weapons," May 7, 2013, http://www.cnn.com/2013/05/06/opinion/bergen-chemical-weapons-syria/.

10 "Syrian regime makes chemical warfare threat." *The Guardian*, July 23, 2012,http://www.theguardian.com/world/2012/jul/23/syria-chemical-warfare-threat-assad.

foreshadowed Assad's willingness to do anything necessary to remain in power.[11]

Early uses in Syria were very small and targeted against hardened opposition strongholds where conventional forces were lacking success. The unconfirmed reports of these uses started to trickle out of Syria, but did not rise to a level that generated a call for outside intervention or even outrage. Rather, the international community's general desire not to intervene in internal conflicts resulted in near silence and invited continued low-level use for another year. This all changed in the wake of a large-scale sarin attack in East Gouta, Syria that left over 1,200 dead. This attack led the United States to the brink of military strikes against Syrian military targets before a diplomatic option presented itself and the international community came together under UN Security Council Resolution 2118 to destroy Syria's chemical stockpile outside of the warzone.

The international effort did not stop Assad's chemical weapons efforts—while the operation succeeded in eliminating the regime's major warfighting capability, it left its personnel and research facilities in place. By retaining chemists, engineers, and weapons designers, the Syrian government was able to avoid the failure al-Qaida in Iraq suffered in effectively weaponizing chlorine in 2006. The Syrian solution was helicopter-borne barrel bombs, which correctly balanced the amount of explosives necessary to maximize the lethal dispersal of chlorine.[12] Not only have attacks using chlorine continued into 2017, but the Syrian government is also accused of using aerial bombs filled with sarin or a "sarin-like" substance during the April 4, 2017 attack on Khan Shaykhun that killed 89 people and led to a U.S. missile attack on the Shayrat Airbase.[13,14] Ultimately, the weapons have proven to be quite effective in targeting unprotected civilians and could form a model for a future North Korean ground emplaced variant.

The use of chemical weapons by Syrian forces may have emboldened ISIS to reinvigorate its interest in chemical weapons. Its success in capturing large swaths of western Iraq provided ISIS with access to the raw materials, intellectual knowledge, facilities, and the time and space necessary to develop what appears to be a small-scale chemical weapons program. This came to light in August 2015 when Kurdish authorities made public that ISIS employed mustard agent against Peshmerga forces.[15] The subsequent reports of only sporadic chemical attacks may imply that ISIS has not succeeded in scaling up its production. There could be any number of possible reasons for this, ranging from lack of raw materials and coalition forces' destruction of key facilities to resistance from coerced scientists. What ISIS has demonstrated is that an organized force, such as Kim regime loyalists or a local army unit, capable of establishing a sanctuary that includes the

11 While the Syrian Arab Republic was not a signatory state to the Chemical Weapons Convention at the time, Syria had joined the Geneva Protocol, which prohibits the use of chemical weapons in international armed conflict, on December 17, 1968.

12 Virginia Gamba, Adrian Neritani, and Eberhard Schanze, *Third Report of the Organization for the Prohibition of Chemical Weapons – United Nations Joint Investigative Mechanism*, August 24, 2016, 9-11.

13 Angela Dewan and Hamdi Alkashali, "Syria Chemical Attack: Authority Finds 'Incontrovertible' Evidence of Sarin," *CNN, April 20, 2017*, http://www.cnn.com/2017/04/20/middleeast/syria-chemical-attack-sarin-opcw/index.html.

14 Ahmet Uzumcu, "*Note by the Technical Secretariat: status update of the OPCW fact-finding mission in Syria regarding a reported incident in Khan Shaykhun, 4 April 2017*", dated 12 May 2017, http://undocs.org/S/2017/440.

15 Helene Cooper, "ISIS is Suspected of a Chemical Weapons Attack Against Kurds in Syria," *The New York Times*, *August 14, 2015*, https://www.nytimes.com/2015/08/15/world/middleeast/isis-suspected-of-chemical-attack-against-kurds-in-syria.html?_r=0.

proper infrastructure and human capital, can effectively develop and use chemical or potentially biological weapons.

2. Biological Weapons Use

Historical examples of biological weapons development and use are far fewer, more historically distant and for the most part offer fewer insights into potential Korean scenarios. These include the major biological weapons programs of the US and USSR during the Cold War, Japan's Unit 731 experimentation in China during World War II, and one-off events such as the 1984 salmonella attack by the Rajnesshees group that sickened approximately 750 people in Oregon.

These three examples range from global superpowers developing the means to destroy entire agricultural sectors of their adversaries to a group trying to simply sway a local election. While these are all interesting in their own right, they do not clearly fit within the scenario of a collapsing North Korea. A far less well-known but more relevant example is the Polish Resistance during World War II, which demonstrated how an organized resistance could utilize its country's former state program to support covert or unattributed attacks on superior military forces or leadership-related targets.

Following its re-establishment as a country in 1918, Poland began working in 1925 on a biological defense program that included laboratory analysis of agents and surveillance of infectious disease outbreaks within Poland. It is currently unknown if the program developed an offensive program, but it is clear that by the mid-1930s, Japan's Unit 731 was actively visiting Poland, and the opportunity existed for a cross-pollination of ideas and technology.

Simultaneously, Poland was very conscious of its precarious position between Nazi Germany and the USSR and developed war plans that included an active resistance effort in the event of an invasion. The Polish government-in-exile created the Zwiazek Walki Zbrojnej (ZWZ) to direct activities of the myriad small resistance units that became operational across the country shortly after the September 1, 1939 invasion by Germany.[16] The ZWZ's purpose was to pave the way for a larger armed uprising. On March 19, 1940, Colonel Stefan Rowecki, ZWZ Commander, reported to his superior that he had "created a special unit concerned with chemical-technical-bacteriological operations … firstly to destroy material and equipment, secondly—infecting people without threat to our population, and even moving them into the Reich territory using exported workers".[17]

By the spring of 1941, the ZWZ was operating eight laboratories producing typhoid, dysentery, glanders, anthrax, rabies and several slow acting poisons.[18] Neither the Polish government-in-exile nor the German government publicized the attacks, and the two countries' documentation on casualties do not line up, so it is not possible to precisely determine the effectiveness of the effort. For instance, the Polish resistance purportedly attacked 6,410 people during a 16-month period spanning 1943-1944.[19] While the number of those actually infected was probably some fraction of

16 Robert Petersen, ""When a nation is being murdered" – The secret biological and chemical war against the Third Reich," *Zeszyty Naukowe AON* 103 (2016): 161-163, ISSN 0867–2245.
17 Ibid, 164.
18 Ibid. 165.
19 Ibid. 171.

that, it is clear that Germany took the threat seriously enough that it had some impact on German security operations. German leadership went so far as to suppress threat information from security forces and the general public, presumably to avoid panic, while actively targeting Polish biological weapons cells. [20]

In the end, the biological weapons attacks and other conventional sabotage by the Polish resistance did not effectively weaken the German occupation before the Warsaw Ghetto Uprising of 1944. However, it provides a model for how the Kim regime might adapt the state's biological weapons program to become part of an organized resistance in North Korea intent on weakening a new ROK-led government prior to a large-scale uprising.

III. Possible Use in a Collapsing DPRK

What might WMD use or proliferation look like should North Korea collapse? The clear first answer is, "it depends on how collapse occurs." A number of factors will influence this answer: the speed of collapse, state of the government, access to materials by knowledgeable individuals, and level of resistance to outside intervention, to name a few. Rather than try to describe every collapse scenario, some likely ways US and ROK forces could encounter WMD based on the previous historical examples are identified below.

1. Chemical Weapons Use

Should the United States and South Korea find themselves crossing the DMZ to stabilize a collapsing North Korea, they will likely face a well-entrenched Korean People's Army (KPA). Even if the state of the central government is unclear, the United States and its ROK allies should not assume that these forces and the large chemical stocks they control would have simply faded away. These forward KPA units likely maintain prepared plans to defend against a ROK and US attack that almost certainly includes the tactical employment of chemical weapons.

North Korean doctrine and planning would likely follow a historical Soviet template that includes mixing high explosive and fast-acting, non-persistent chemical artillery fires to inflict mass casualties on maneuver forces, command and control, and logistics facilities. Furthermore, given the basic topography of North Korea, the KPA could employ persistent chemical agents, like mustard, VX nerve agent or lewisite, in conjunction with other obstacles along difficult terrain to block a coalition advance. While the rest of the world has moved on from these mid-20th Century concepts of CW employment, the combination of doctrine and geography suggests such use is highly plausible, even in a collapse scenario, because of the decades of indoctrination within the KPA that an attack from the South is imminent.

Depending on how the collapse occurs, coalition forces could face an environment where Kim Jong Un, like both Saddam Hussein and Bashir al-Assad before him, is using chemical weapons against his own citizens. If there are local uprisings or a breakaway province, the coalition may need to respond to use against North Korean civilians in one area and continue fighting KPA forces elsewhere in the country.

20 Ibid. 169-170.

History does not provide examples of states employing chemical weapons against another nation's civilian population. However, the geography of the Korean peninsula allows for this strategic employment not seen in the past. Further, in comparison to Syria, where Assad created new delivery systems to use both sarin nerve agent and later chlorine against specific small targets, the KPA is well-positioned to use long-range artillery, particularly in the Kaesong Heights, against the 25 million people in Seoul, and ballistic missile units further north against other South Korean cities, such as Busan. These attacks, most likely intended to sever popular support for the South Korean war effort, could occur from the very beginning of a ROK intervention and, given the quantity of ballistic missiles in North Korea, it could be sustained throughout the campaign.

Irrespective of the intensity of organized forward resistance, coalition forces should expect that some small-scale regular KPA units, for instance, artillery or engineer units, that know how to handle large munitions and explosives, could attempt to hinder their advance north. These disruptive efforts could parallel the early insurgency in Iraq and include emplacement of IEDs built out of available artillery, mortar ammunition and chemical agents already near the DMZ to blunt a rapid coalition attack.

To further complicate the initial attack, the vast numbers of artillery systems and mortar tubes spread throughout North Korea would allow loyalists or local commanders to attack coalition forces with chemical rounds from several miles away. The coalition forces would not only have to counter the local IED threat, but also suppress attacks that may be originating from another unit's area of responsibility. Again, as with the missile attacks into South Korea highlighted above, these indirect fire attacks could continue in an organized manner far longer than the resistance in Iraq.

Once coalition forces successfully pass through the forward KPA defenses, it may become more difficult for a resistance (particularly if it is not well organized) to acquire chemical rounds for use in IEDs. However, the threat would not disappear; for instance, this phase of the intervention could be marked by deliberate chemical attacks against coalition bases or convoys similar to the AQI attacks in 2006 and 2007. This is possible because of the confluence of former KPA Special Forces soldiers, individuals who worked at special weapons facilities and may have insights into locations of chemical weapons stockpiles or toxic industrial chemicals, and scientists who can build complex improvised devices specifically intended to spread a chemical agent. By bringing this mix of human capital and materials together, North Korean loyalist or localized resistance leaders may overcome the employment methodology and engineering shortfalls that befell insurgents in Iraq.

2. Biological Weapons Use

North Korea has the scientific and industrial capability to produce and employ biological weapons.[21] As with all things North Korean, a certain number of assumptions must be made to compensate for the lack of actual information. In the case of biological weapons, it would seem practical that North Korea would produce and maintain only small stocks of deadly toxins and pathogens to support experimentation and culturing; this would allow them to prepare for conflict or covert use as well as to utilize dual use facilities for legitimate purposes on a daily basis. If we assume the cause of the collapse is internal and not because of a failed effort to reunify the peninsula by force,

21 North Korea: Biological Program.

there may not be large quantities of weaponized biological agents available, but rather only small quantities of dangerous pathogens or toxins that could be easily moved or hidden.

The first threat to consider is an insurgent group that acquires access to these limited stocks and is unable to store the pathogens properly for a long period. Such a group would find it in their best interest to employ them quickly, before the pathogens lose their virulence. In order to employ these pathogens, the group would have to overcome the challenge of weaponization. Individuals with a limited background in biological warfare may not be able to develop an effective means of dissemination and if they lack proper safety equipment and protocols, they may actually kill themselves handling the pathogens. If they were able to overcome the challenges of agent life and weaponization, the most likely activities would follow a path similar to the Polish resistance example and target security force leadership or possibly ROK empowered regional political leaders for assassination.

The second biological weapons threat to consider—also similar to the Polish model—is the availability of scientific experts that insurgent groups could recruit or coerce into operating small clandestine labs producing toxins in order to maintain a longer campaign of leadership killings. While it may seem easy to discount this threat given the infrastructure and supply chain challenges they would face, it is important to remember that the Polish resistance was able to maintain a program in occupied Poland with 1940s technology. In the case of North Korea, the regime has proven to be extremely successful in developing sophisticated capabilities with limited resources.

3. Nuclear Weapons Use

Since 2002, multiple US leaders have declared that nuclear weapons in the hands of a terrorist is the gravest national security concern the country faces. As a corollary, the possibility of hardcore regime loyalists or rogue actors with nuclear weapons sets up the nightmare use scenario for stabilizing a post-Kim North Korea. The detonation of a nuclear device in a large population center or in an area that is vital to providing political or logistical support, such as the port city of Hamhung, would fundamentally alter the strategic landscape. In examining ways in which a nuclear weapon could be used, it is valuable to remember that acquiring and detonating a nuclear weapon is possible but not simple, even in North Korea. Three possible scenarios include efforts to deescalate through either threat of use or demonstrated use, use during early intervention, and use during stabilization efforts further north. This paper will not address what is a clear act of war, a deliberate pre-collapse nuclear attack against either the US, ROK or other nation by the Kim regime still in control.

Early in a crisis, while conditions for a collapse are escalating and capitals are considering intervention in a collapsing North Korea, Kim Jong Un could determine that the best chance to remain in power would be to break coalition resolve. He could do this by either escalating his routine threats of preemptive attack or by conducting a more escalatory open-air detonation over either international waters or North Korean territory. Although not a clear act of war, this would be a high-risk proposition. It would draw broad international condemnation and could stiffen international resolve to bring an end to the Korean problem once and for all. It could also be interpreted as the most severe provocation that North Korea has ever undertaken and as a precursor to actual nuclear use against Seoul, thereby precipitating immediate US and ROK intervention.

Alternatively, it could trigger overt Chinese or Russian steps to prop up the Kim regime to deter intervention. Regardless, a detonation would likely cause all parties to investigate stabilizing actions that could preclude troops from entering the DPRK.

Whether Kim Jong Un employs a nuclear weapon in an effort to deescalate or not, coalition forces would need to be prepared for the very real threat of nuclear weapons use once they intervene into the north. Much like the early use of chemical weapons described before, nuclear weapons use against forces crossing the DMZ to inflict mass casualties or against South Korean civilian targets is plausible. Both of these scenarios could increase public pressure on a coalition to halt their intervention. An important distinction from the chemical weapons use scenario is that nuclear weapons presumably would be subject to much tighter command and control with only the head of state retaining release authority. Therefore, nuclear use in this scenario would likely mean that Kim Jong Un, or a designated successor with access to the nuclear command and control structure, is attempting to retain power rather than a local commander simply executing a plan.

As forces move to stabilize the interior of the country, it would be possible, though not highly likely, that someone within the small number of individuals with knowledge and access to North Korea's nuclear arsenal could access and potentially detonate a weapon. This scenario would still carry major strategic implications as it would be the first use of nuclear weapons since 1945 and it would affect military planning and operations within the area. In this scenario, the combination of a limited North Korean road network and effective coalition inspections along routes might limit the ability to transport the device to a highly populated area or into South Korea proper. By leaving the perpetrators with only an option to detonate the weapon in a more rural area, some world leaders may deem this "more acceptable" because of a reduced casualty count and the confinement of use to DPRK territory.

A somewhat more plausible nuclear-related scenario would include scientists and engineers creating radiological, chemical and environmental hazards by sabotaging facilities related to the nuclear weapons program. For instance, they could deliberately release contaminated waste into a water source or damage the safety systems on the 5 MWe experimental reactor at the Yongbyon Nuclear Scientific Research Center, resulting in a radiological release. The closest historical example of such sabotage was the Iraqi destruction of Kuwaiti oil fields in the first Gulf War. These types of sabotage can generate not only actual hazards on the ground, but also bureaucratic and political distractions. For instance, the possibility of a radiological release from the Fukushima nuclear power plant drew more US government concern than the vastly larger disaster relief efforts that were ongoing in Japan.

IV. Proliferation Concerns During Intervention

While nuclear, chemical or biological weapons use is an important consideration and could clearly lead to disastrous outcomes, the possible transfer of WMD weapons or critical technology out of the DPRK to other rogue states or extremist groups can be expected to seize the interest of world leaders. The possibility of a nuclear weapon in the hands of a terrorist group will do more to stimulate national leaders to action than any famine, number of displaced persons or economic setback associated with rebuilding North Korea. Similar concerns date back to the fall of the Soviet Union and drove major efforts such as the Cooperative Threat Reduction (CTR) program.

The CTR initiative was vital in accounting for and consolidating Soviet weapons, improving security at Russian facilities, destroying weapons and redirecting scientists to productive legitimate employment. These accomplishments were born out of years of US-Soviet arms control discussions and a willing partner in the new Russian government. The new government recognized the advantage of accepting outside assistance to safeguard and dismantle unnecessary nuclear weapons and was open to declaring and eliminating their inherited chemical program.

In the case of North Korea, the problem could manifest itself in a very different way than it did in the Soviet Union. In a collapsed North Korea that causes the US and ROK to intervene, the potential to collaborate with a cooperative government with full knowledge of the programs is unlikely. The lack of insight into the North Korean programs leaves glaring information gaps on the numbers and locations of weapons, quantities of key components (fissionable material and chemical precursors) and scientists with marketable expertise. Thus, efforts focused on finding a loose weapon or rogue scientist start at a clear deficit. Another factor that adds complexity to this challenge is the already existing conventional arms and counterfeit product sales networks that North Korea has throughout Asia, the Middle East and Africa. These networks provide well-established pathways to potential buyers and likely include clandestine methods for moving materials and financial transactions.

North Korean WMD materials or personnel might move during a collapse along three basic pathways:

1. *Kim Jong Un seeks to sell or transfer capabilities as part of a last-ditch attempt to remain in power:* While the regime retains a level of control over the arsenal, senior officials could sell or trade capabilities (weapons, people, files, etc.) for hard currency to shore up the country's economy or buy the loyalty of potential rival elites. This action could be a sign of either a desperate Kim Jong Un or a regime that believes it has a large enough arsenal to meet its security needs and is willing to distance itself further from the international community by proliferating WMD capabilities to other actors. This type of proliferation could be nearly impossible to see depending on what is being transferred, for instance, a data file over the dark web or a single unknown scientist. Even something as significant as a nuclear warhead could potentially be shipped out of the country on a North Korean commercial vessel or overland into China or Russia before the border is closed and the world may never see the movement.

2. *Theft or diversion of WMD material or provision of expertise by individuals associated with access to these programs to desirous WMD possessors:* Where the previous scenario operated through existing networks and was organized within the government, this scenario is decentralized, with potentially multiple groups or individuals pursuing any number of pathways. Scientists closer to the Chinese border may attempt to infiltrate across the land border, while military commanders close to the coast may attempt to smuggle weapons through China aboard fishing boats or coastal submarines. Meanwhile, workers at research facilities could steal and hide high value equipment with the intent of selling it on the black market simply for money. Given the scale of the DPRK WMD programs and the large number of possible actors, this scenario could play out across the country early in a collapse and coalition authorities may have no insight as to what is occurring nor access to

vital regions of the country to prevent it.

3. *Actors within the DPRK seize materials, to include weapons, for negotiating leverage within North Korea:* This could include military commanders with access to chemical, biological or nuclear weapons who recognize that possession of the weapons provides them leverage and the perception of power. Actors could retain these weapons to establish localized authority, adding further complexity to efforts to establish a new governance structure. These actors could also barter the weapons or material with the new national authority to gain status in a new government, money or safe passage out of the country.

V. Conclusion

Combining historical examples and existing knowledge of North Korea's WMD programs and doctrine offers insight into the WMD use and proliferation risks the United States and its allies might face in a collapse scenario. Chemical and biological weapons could be used tactically by insurgents or regime remnants against "occupying forces" during an operation to stabilize a collapsing North Korea. These groups could attempt to create security vacuums and inflict mass casualties—or, based on experience in Iraq and Poland, to either directly force a withdrawal of coalition forces or create the conditions for a wide scale uprising. Any nuclear weapons use would be a high risk/high reward option focused on breaking ROK and US support for intervention. Finally, there remains the possibility of chemical, biological and nuclear weapons being smuggled out of the country. Policy makers and planners may not be able to eliminate these risks, but they can take some concrete actions before intervening to reduce them:

- *Broaden the Deterrence Message:* Today's North Korean deterrence efforts focus on trying to deter Kim Jong Un from advancing his nuclear and ballistic missile programs. US and ROK leaders need to begin designing a deterrence strategy that includes not only deterring a nuclear-capable Kim regime, but also those individuals or groups that could potentially acquire chemical, biological and nuclear weapons, materials or equipment—for example, the loyalists and senior military commanders who could supplant Kim Jong Un or become regional warlords. This strategy should establish a means to communicate with these entities and a mechanism that identifies individuals responsible for WMD attacks and holds them accountable for their actions.

- *Contain the Problem:* A key first step is preventing the proliferation of materials out of North Korea, thereby keeping the problem contained to one location. Plans should include actions to rapidly shutdown transit routes out of the country, cut off communications with North Korean arms brokers in other regions of the world, and sensitize other regional actors to the increased challenge that will exist during a collapse. This will allow those countries the time necessary to acquire and plan for capabilities to inspect and detain vessels and nefarious actors leaving the country during a crisis.

- *Prepare for Use Now:* Coalition forces and other government agencies should expect to respond to periodic chemical weapons use throughout a stabilization period. They will require the equipment and training to detect and mitigate the physical and psychological effects of the weapons. If possible, the training exercises should include all potential

contributing nations to prevent the creation of weak links in the coalition.

- *Don't Skip Steps:* It will be impossible to capture every weapon instantaneously, but military forces cannot be so focused on the "rush to Pyongyang" that they bypass and fail to secure large caches of weapons or production facilities that will fuel the insurgency. Even if they cannot take the time to analyze each round, they must take the time to reduce the chances of theft. This can be done by securing the munitions in place, moving them to a more secure location, or emplacing surveillance equipment that can alert a rapid reaction unit of potential efforts to steal materials.

- *Remain Resilient:* South Korea and the United States need to recognize and accept that a stabilization effort of this scope will take time and that some level of chemical and biological warfare is likely to occur. As mentioned above, governments must be ready to mitigate the effects of the attack and not let them disrupt efforts to establish security and a better way of life for North Koreans. And simultaneously, they will need to shore up public resolve at home to continue what will undoubtedly be an arduous process to stabilize North Korea and attain a full accounting of its past WMD programs.

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